FACT SHEET
for Proposed Permit Limits (New Permit)

FACILITY NAME: Silver Bow Generation Plant

PERMITTEE: Continental Energy Services, Inc.
101 Main St.
Butte, MT 59701

CONTACT: Dick Cromer
President
Ph. (406) 497-6663

PERMIT NO.: MT-0030627

RECEIVING WATERS: Silver Bow Creek, Sheep Gulch, and Ground Water

A. Status of Permit

This is a new permit for a facility that has not yet been constructed. This permit will have a term of five years from the date of issuance.

Based on the Standard Industrial Code (4911, Electric Services) with an anticipated power output of 500 MW, the Department has determined that the proposed Silver Bow Generation Plant is a major facility [ARM 17.30.1304(30)].

B. Description of the Discharging Facility

The Silver Bow Project is a nominal 500 MW natural gas fired combined cycle combustion turbine electric generating station. It is located in the Silicon Mountain Technology Park (Technology Park) west of Butte, Montana in Silver Bow County. The site for the facility is a 20-acre parcel that is east of the Advanced Silicon Materials Inc. (ASiMI) facility, in the northeast quarter of Section 35, Township 3 north, and Range 9 west (Figure 1). The major power producing components will be two Siemens-Westinghouse 501FD combustion turbine units (CTs) and a matched steam turbine unit (ST). This arrangement is referred to as a 2 on 1 configuration. The facility will generate power for sale to customers in the Western Systems Coordinating Council (WSCC) power market, including existing and future Technology Park industries.

The raw water supply for the plant will be from an existing 30-inch water line that parallels the west side of the main access road of the Technology Park. The water used in the Technology Park is supplied from the Silver Lake Reservoir system.

The facility is projected to consume a maximum of approximately 3,262 gallons of water per minute (gpm). The average water use will be approximately 2,675 gpm. It is estimated that a 16-inch water line, about 3,000 feet in length, will need to be routed from the main Technology Park 30-inch pipeline to the site.

Butte-Silver Bow County will provide the required water from existing Silver Lake water rights that are currently and have been historically designated for industrial use. No major modification of the existing water supply infrastructure is anticipated. Continental Energy Services (CES) will enter into an industrial customer agreement with Butte-Silver Bow County and water service will be provided through that agreement.

The facility will require an average of 2,675 gpm of water from Silver Lake (water requirements will be higher in the summer and lower in the winter). Approximately 90% of that water is lost to evaporation.

The discharge water consists primarily of non-process cooling tower blowdown water. The cooling water from Silver Lake will be cycled through the facility approximately 10 times prior to its release to the wastewater collection sump. During the cycling, the evaporation that occurs will concentrate constituents in the raw water. Some of the raw water is used for plant & equipment drains, and is diverted to an oil/water separator before being discharged to the wastewater collection sump. From the wastewater collection sump the effluent is discharged to a surge pond to allow settling of solids. From the surge pond the effluent will be diverted to one of the three outfalls.

Both chlorine and phosphorus will be added to the water. Chlorine is added to control biofouling of the facilities condenser tubes, and phosphorus is added to control scaling in the pipes.

The projected maximum wastewater discharge is approximately 300 gpm. The average wastewater discharge is approximately 250 gpm. The difference in the raw water consumption rate (2,675 gpm) and the wastewater discharge rate (300 gpm) primarily represents the cooling tower evaporation. The specific methods of disposing of the wastewater are discussed in Section C.

C. Description of Discharge and Discharge Points

1. **Past Discharge Data**

This is a new facility, there is no past discharge data. The MPDES permit application includes predicted concentrations for parameters anticipated to occur in the discharge water (see Table 1). The anticipated average discharge rate is 250 gpm. The anticipated maximum discharge rate is 300 gpm. The discharge rates will be higher in the summer and lower in the winter.

Table 1: Measured Raw Water Quality and Anticipated Effluent Quality.

Parameter	Raw Water Quality[1]	Anticipated Average Effluent Quality[2]
pH, standard units	7.6	8.3
Specific Conductivity, umhos/cm	233	3,157
Alkalinity, "M" as CaCO3, mg/L	108	208.2
Sulfate, mg/L	12.1	1036.8
Chloride, mg/L	7.5	130.4
Total Phosphate, mg/L	0	6.2
Nitrate, mg/L	0.1	1.2
Silica, mg/L	4.9	52.1
Calcium, mg/L	76	806.9
Magnesium, mg/L	33	350.4
Sodium, mg/L	8	126.2
Potassium, mg/L	1.1	11.679
Total Dissolved Solids, mg/L	153	1,879
Total Suspended Solids, mg/L	4	45.223
Total Organic Carbon, mg/L	2	18.485
Oil and Grease, mg/L	0	1.003
Aluminum, dissolved, mg/L	0.017	0.18
Antimony, total recoverable, mg/L	<0.003	<0.0319
Arsenic, total recoverable, mg/L	0.001	0.012
Barium, total recoverable, mg/L	0.033	0.354
Beryllium, total recoverable, mg/L	<0.001	<0.0086
Boron, total recoverable, mg/L	<0.050	<0.427
Cadmium, total recoverable, mg/L	<0.00005	<0.00045
Chromium, total recoverable, mg/L	<0.0025	<0.0265
Copper, total recoverable, mg/L	0.002	0.024
Fluoride, total recoverable, mg/L	0.37	3.958
Iron, total recoverable, mg/L	0.016	0.271
Lead, total recoverable, mg/L	<0.0005	<0.0043
Manganese, total recoverable, mg/L	0.003	0.032
Mercury, total recoverable, mg/L	<0.0001	<0.0011
Molybdenum, total recoverable, mg/L	<0.06	<0.513
Nickel, total recoverable, mg/L	<0.01	<0.085
Selenium, total recoverable, mg/L	<0.0005	<0.0043
Silver, total recoverable, mg/L	0.0005	0.0043
Strontium, total recoverable mg/L	0.082	0.871
Thallium, total recoverable, mg/L	<0.0015	<0.01595
Tin, total recoverable, mg/L	<0.05	<0.427
Titanium, total recoverable, mg/L	<0.01	<0.085
Vanadium, total recoverable, mg/L	<0.01	<0.085
Zinc, total recoverable, mg/L	0.011	0.117

(1) Concentrations based on Silver Lake water quality from Montana DEQ public water supply database and from BetzDearborn Water Analysis report as reported in the MPDES permit application.
(2) Concentrations based on conceptual characterization submitted with MPDES permit applicartion.

2. **Effluent Outfalls:**

The applicant proposes to discharge wastewater to three outfalls.

Outfall 001 will be equipped with an effluent diffuser system, emptying into Silver Bow Creek located at approximately 46°00'10" N latitude, 112°40'27" W longitude. The maximum discharge volume will be approximately 300 gpm and will occur between October 1 and April 30.

Outfall 002 is at the end of a discharge pipe emptying into the Sheep Gulch located at approximately 45°58'12" N latitude, 112°40'56" W longitude. The maximum discharge volume will be approximately 300 gpm and will occur between October 1 and April 30 (213 days). Outfall 002 can be used as an emergency outfall for a maximum of 14 days between May 1 and September 30 in any given year. An unknown percentage of the discharge to Sheep Gulch will infiltrate into the ground water.

Outfall 003 will be a spray irrigation system located at approximately 45°58'25" N latitude, 112°40'30" W longitude. The maximum discharge volume will be approximately 300 gpm and will occur between May 1 and September 30 (152 days). The land application will consist of one to three pivot irrigation sites (see Figure 1) that will irrigate approximately 100-200 acres of land. Discharge from the pivots will be rotated to maintain unsaturated conditions in the sediments.

D. Description of Receiving Waters

1. Silver Bow Creek – Outfall 001

The facility is located in the Upper Clark Fork River Basin. The hydrologic unit code (HUC) is 17010201, and the Waterbody Number is No. MT76G003-020. Silver Bow Creek in the area of the discharge is listed as impaired on the state 1996 and 2000 303(d) lists. The impaired uses on the 1996 list are drinking water supply, aquatic life support, cold water fishery (trout), and swimming. The probable causes of impairment are metals, nutrients, organic enrichment/DO, other habitat alterations, priority organics, siltation and unionized ammonia. The probable sources are listed as municipal point sources, mill tailings, mine tailings, resource extraction, stream bank modification/destabilization, subsurface mining, surface mining, and wastewater. The Upper Clark Fork River Basin has a target TMDL completion date of 2007.

In the area of the discharge, Silver Bow Creek is classified as "I" by the Water Quality Standards [ARM, 17.30.607(1)(b)]. The goal of the state of Montana for waters classified "I" is to have these waters fully support the following uses: drinking, culinary, and food processing purposes after conventional treatment; bathing, swimming, and recreation; growth and propagation of fishes and associated aquatic life, waterfowl, and furbearers; and

agricultural and industrial water supply [ARM 17.30.628(1)]. As the quality of Silver Bow Creek improves in the future, permit limits may need to be adjusted. When the classification of Silver Bow Creek is upgraded from "I", the permit effluent limits will be modified to meet the applicable water quality standards.

The discharge is considered a new source pursuant to the nondegradation regulations (ARM 17.30.702(16)). However, because Silver Bow Creek in the area of the discharge is classified as "I", it is not a high quality water [75-5-103(10)(b)(i), MCA], and pursuant to 75-5-303(2), MCA the nondegradation requirements are not applicable to Silver Bow Creek at this location. The water-quality based effluent limits in the permit will be submitted to EPA Region VIII for approval as a TMDL under section 303(d) of the federal Clean Water Act.

The 7-day 10-year (7Q10) low flow for Silver Bow Creek below Blacktail Creek is 12 cfs as measured at USGS Gauging Station No. 12323250, which is located approximately 5 miles upstream of the outfall. The period of record was from 1985 through 1994 [USGS, 1994, Stream Gauge Data compiled for the Department of Environmental Quality].

On September 21, 2000, a U.S. District Judge issued an order stating that until all necessary total maximum daily loads (TMDLs) under Section 303(d) of the Clean Water Act are established for a particular water quality limited segment (WQLS), the State is not to issue any new permits or increase permitted discharges under the MPDES program. The order was issued in the lawsuit Friends of the Wild Swan v. U.S. EPA, *et al.*, CV 97-35-M-DWM, District of Montana, Missoula Division. The Department finds that the issuance of this permit does not conflict with this order because the discharge to Silver Bow Creek will have water-quality-based effluent limits that will be submitted to EPA as the necessary TMDLs for issuing a new permit on a WQLS.

The Montana Water Quality Act authorizes the issuance of point source discharge permits on a listed water body pending completion of a TMDL [75-5-703(10)(a), MCA] provided that: 1) the discharge is in compliance with the provisions of 75-5-303, MCA (Nondegradation Policy); 2) the discharge will not cause a decline in water quality for the parameters by which the water body is impaired; and, 3) the minimum treatment requirements are met. The permit will meet these three requirements.

2. Sheep Gulch – Outfall 002

Sheep Gulch is tributary to Silver Bow Creek, and is not listed on the state 1996 or 2000 303(d) list. The natural condition of Sheep Gulch in the area of the discharge is an ephemeral drainage. Sheep Gulch is classified as B-1 pursuant to ARM 17.30.607(1).

Since 1998 ASiMI has been discharging wastewater to West Fork Sheep Gulch under MPDES permit #MT-0030350. The CES discharge will be located in Sheep Gulch approximately one mile above the confluence of Sheep Gulch with the West Fork Sheep Gulch (Figure 1).

Due to the effluent discharge from the ASiMI facility into West Fork Sheep Gulch, Sheep Gulch is a perennial stream below its confluence with West Fork Sheep Gulch. Therefore,

B-1 water quality standards apply to West Fork Sheep Gulch (below the ASiMI discharge) and in Sheep Gulch (below the confluence with West Fork Sheep Gulch).

Because Sheep Gulch is ephemeral in the area of the discharge, the discharge must comply with the water quality standards of ARM 17.30.635 and 17.30.637, but is not required to meet the specific water quality standards for B-1 waters (ARM 17.30.623) until the wastewater enters the perennial section of Sheep Gulch where B-1 water quality standards apply. The discharge to Sheep Gulch will occur for a maximum of 227 days per year (213 days from October 1 through April 30, and up to 14 days outside that period as an emergency discharge). Under those restrictions the Department believes that Sheep Gulch, in the area of the discharge, will maintain its ephemeral nature. The effluent limits will be set to comply with ARM 17.30.635 and 17.30.637 at the outfall.

The discharge is considered a new source pursuant to the nondegradation regulations (ARM 17.30.702(16)). However, because Sheep Gulch in the area of the discharge has zero flow for more than 270 days during most years it is not a high quality water [75-5-103(10)(b)(ii), MCA]. Therefore, pursuant to 75-5-303(2) and 75-5-103(5), MCA, the nondegradation requirements are not applicable to the portion of this discharge that remains as surface water in Sheep Gulch.

Based on data from the similar discharge from the nearby ASiMI facility, a portion of the discharge to Sheep Gulch will infiltrate to the ground water in the fluvial deposits beneath the Sheep Gulch drainage. The background specific conductance of the receiving ground water ranges from 210 to 463 umhos/cm based on wells GW-1, MW97-1 and MW97-5 (see figure 2 and attachment 3). The ground water is a Class I ground water (ARM 17.30.1006), which is a high quality state water (75-5-103(10), MCA). This new discharge is a new source of pollutants to the high quality ground water. The nondegradation requirements apply to new and increased sources that cause a change in quality of high quality state waters (ARM 17.30.701 and 17.30.702(16)). Montana's Nondegradation Policy states that the existing quality of high quality state water must be protected and maintained (75-5-303, MCA). The Human Health WQB-7 (September 1999) water quality standards also apply to the ground water beneath the Sheep Gulch drainage. Effluent and ground water monitoring will be required in the permit to insure water quality standards and nondegradation criteria are not exceeded, and to determine if effluent limits will be necessary.

On September 21, 2000, a U.S. District Judge issued an order stating that until all necessary total maximum daily loads (TMDLs) under Section 303(d) of the Clean Water Act are established for a particular water quality limited segment (WQLS), the State is not to issue any new permits or increase permitted discharges under the MPDES program. The order was issued in the lawsuit Friends of the Wild Swan v. U.S. EPA, *et al.*, CV 97-35-M-DWM, District of Montana, Missoula Division. The Department finds that the issuance of this permit does not conflict with this order, because Sheep Gulch and its tributaries are not listed on Montana's § 303(d) list as a WQLS and therefore no TMDL is necessary for the discharge.

3. Ground Water – Outfall 003

Alluvial ground water in the vicinity of the discharge (in the Sand Creek and Sheep Gulch drainages) is classified as Class I [ARM 17.30.1006(1)(a)]. Class I ground waters

are suitable for the following beneficial uses with little or no treatment: public and private water supplies; culinary and food processing purposes; irrigation; drinking water for livestock and wildlife; and for commercial and industrial purposes [ARM 17.30.1006(1)(b)(i, ii, iii, iv, and v)]. Specific water quality standards for class I ground waters are contained in ARM 17.30.1006(1) and WQB-7 (DEQ, September 1999).

The discharge is not expected to migrate beyond the shallow sediments, and is not expected to impact the underlying ground water. Therefore, outfall 003 is not considered a new source under the nondegradation requirements (ARM 17.30.702(16)) and a significance determination is not necessary for this outfall.

E. Mixing Zone

1. Silver Bow Creek – Outfall 001

An effluent diffuser will be placed across the entire stream width (at low flow conditions) to achieve nearly instantaneous mixing. By definition [ARM 17.30.502(7)] nearly instantaneous mixing occurs within two stream widths downstream of the discharge location and is a standard mixing zone. Facilities with nearly instantaneous mixing zones shall use the 7Q10 flow of the receiving water for the mixing zone calculations (ARM 17.30.516(3)(d)).

For I Class streams the limits for toxic, carcinogenic and harmful parameters apply to the effluent without mixing, therefore the mixing zone cannot be used for those parameters (ARM 17.30.628(2)(h)(iv)).

2. Sheep Gulch – Outfall 002

Surface Water

A surface water mixing zone has not been requested by the permittee (if requested, a surface water mixing zone could not be granted because the stream is ephemeral).

Ground Water

CES has requested a source specific ground water mixing zone for Outfall 002. The mixing zone will extend in the ground water beneath Sheep Gulch from outfall 002 for approximately 6,000 feet to the point where Sheep Gulch is diverted in a northwest direction around the Rhodia, Inc. tailings ponds (Figure 1). Using the 5 degree tangent [ARM 17.30.517(1)(d)(iii)(B)], the mixing zone width is 1,060 feet at the end. Because the fluvial and alluvial material appear to be in hydraulic connection, it did not seem reasonable to limit the mixing zone width to the much narrower width of the fluvial channel (see discussion of aquifer properties below). The standard mixing zone depth of 15 feet will be used [ARM 17.30.517(1)(d)(iii)(A)].

The depth to ground water directly beneath the outfall location is approximately 30 feet. This is based on extrapolation of ground water levels measured in three ASiMI ground water wells (GW-1, GW-2 and GW-3) that have been monitored since 1998.

Using ground water maps from several sources (Borduin 1999; Barr 1999; and Continental, 2001) the average hydraulic gradient is approximately 0.0068 ft/ft (North) in the area of Sheep Gulch drainage. The gradients were determined using wells screened in both the deeper and shallower aquifers but due to the common static water levels in the two systems and the hydraulic connection between the fluvial and alluvial material (Barr, September 1999), the gradients are considered an accurate representation of the shallow ground water levels.

Numerous pumping tests and specific capacity tests have been conducted in the Sheep Gulch and Sand Creek drainages (Borduin, 1999). However, most of those tests were conducted in wells completed significantly below the shallow ground water, which is where the mixing zone will be granted. Two pumping tests (in wells PW-99-1 and PW-99-3) with observation wells (P-99-2 and P-99-4) were conducted in the shallow ground water in the fluvial material beneath Sheep Gulch (Barr, September 1999). The well locations are shown in Figure 2. The average hydraulic conductivity measured in the two observation wells was 76 feet/day, which is the most applicable data available for the fluvial aquifer. The results of these two pumping tests indicated that the alluvial material, which consists of finer grained material than the fluvial aquifer, did not act as a significant hydraulic boundary as would expected based on the composition of each aquifer. Secondary porosity (e.g. fractures) in the alluvial material is likely the cause of the higher than expected hydraulic conductivity. If any interpretation is made from the pumping test data, the alluvium may have actually acted as a positive boundary which indicates the hydraulic conductivity of the alluvial material may be higher than the fluvial material, although there is no method to quantify that difference. Therefore, because it appears the two aquifers are in hydraulic connection and have relatively similar hydraulic conductivities, the width of the mixing zone was allowed to extend from the fluvial aquifer into the alluvial aquifer.

More detailed descriptions of the local geology and hydrogeology are available in Borduin, 1999; Barr, September 1999; and Barr, July 1998.

Downgradient of the outfall 002 ground water mixing zone on the west side of the Rhodia facility are two ground water monitoring wells, MW97-10 and MW97-11 (Figure 2). Ground water monitoring results from those wells indicates that the ground water quality in this area deteriorates for certain parameters due to historical activities at the Rhodia facility and on-going leakage from the tailings ponds. That quality of the ground water measured in those two wells is used in assessing the need for permit limits in section F.2.(ii).

3. Ground Water – Outfall 003

The land application method of discharge for outfall 003 will be conducted at rates less than the hydraulic capacity of the soil. Therefore, a discharge to the ground water (approximately 100 feet below ground surface in this area) is not expected to occur, and a ground water mixing zone is not necessary. Ground water monitoring will be required to confirm that there are no impacts to ground water.

The Butte-Silver Bow Waste Water Treatment Plant has been using approximately 52 to 63 acres of land near the CES property for land application of treated wastewater since 1999.

The area is located in T3N R9W S24, approximately 1 to 1-1/2 miles north-northeast of the CES property. Previous to land applying wastewater the Butte-Silver Bow site was used as a sludge injection site (since 1978) for the Waste Water Plant sludge. There are several ground water monitoring wells surrounding this land application area including upgradient and downgradient wells that are completed in the shallow ground water beneath the site. The data from this site indicates that except for barium and zinc, metal concentrations in both upgradient and downgradient wells are typically below the laboratory detection limits. Barium occurs in one of the downgradient wells (well B) at concentrations one-tenth or less of the groundwater standard (barium was not detected in the upgradient wells). Zinc occurs in all the wells surrounding the site at similar concentrations (approximately 0.02 to 0.06 mg/L). The downgradient wells have some elevated concentrations of chloride, sulfate, and calcium, indicating there has been some impact from the land application, but the data indicates the metals are not infiltrating to the ground water at any significant amounts. One downgradient well (well B) has slightly elevated nitrate concentrations (up to 2.79 mg/L) as compared to the upgradient background concentrations (0.97 mg/L) in wells C and D. The elevated nitrate ground water concentrations are likely related to the historic sludge application since the land application of wastewater has only been occurring for several years. The monitoring well information indicates that with the historic sludge application and the recent wastewater land application rate of over 40 inches per year, there has been little to no impact to the ground water. In comparison, the CES land application area will be irrigated at less than half the rate (less than 20 inches per year) used on the Waste Water Treatment Plant land application area. Although a direct comparison is not applicable here, the ground water monitoring data from the Butte-Silver Bow site indicates that ground water will likely not be impacted from the CES land application outfall.

Ground water maps from several sources (Borduin 1999; Barr 1999; and Continental, 2001) were used to determine that the ground water table is approximately 100 feet below ground surface in the area of outfall 003.

F. Proposed Wastewater Effluent Limits

The effluent limits will be based on the more restrictive of the technology based effluent limit and the water quality based effluent limit. Each type of limit is derived and explained in this section, and the final limits are listed in Section G.

1. Technology Based Effluent Limits (TBEL):

The effluent limitation guidelines for the Steam Electric Power Generating Point Source Category (40 CFR Part 423) apply to this discharge. This facility is a new facility, therefore the new source performance standards (NSPS) listed in 40 CFR Part 423.15 apply to the discharge.

The following limits apply to the proposed facility:

- The pH of all discharges, except once through cooling water, shall be within the range of 6.0 and 9.0 standard units [40 CFR 423.15(a)].

- There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid [40 CFR 423.15(b)].

Table 2: Technology Based Effluent Limits

Parameter[2]	Concentration (mg/L)[1]		Rationale
	30-Day Average	Daily Maximum	
Total Suspended Solids (TSS) mg/L	30	100	40 CFR 423.15(c)
Oil and Grease, mg/L	15	20	40 CFR 423.15(c)
Free Available Chlorine, mg/L[3]	0.2	0.5	40 CFR 423.15(j)(1)
Chromium, total recoverable, mg/L	0.2	0.2	40 CFR 423.15(j)(1)
Zinc, total recoverable, mg/L	1.0	1.0	40 CFR 423.15(j)(1)

(1) See the definitions in Part I.A of the permit for explanation of terms.
(2) The chemicals anticipated to be added to the cooling water do not contain any of the 126 priority pollutants [40 CFR 423.15(j)(1)], therefore technology-based effluent limits for priority pollutants are not required.
(3) Free available chlorine may not be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available chlorine at any one time.

Technology-Based Effluent Limits for Storm water:
The facility will not create any storm water runoff. All storm water will be collected and mixed with the plant effluent.

2. Water Quality Based Effluent Limits (WQBEL):

(i) Silver Bow Creek – Outfall 001

Effluent limits for pollutants will be based on State standards as listed in Circular WQB-7 (September, 1999). When a mixing zone is necessary to meet water quality standards, the following equation will be used to assess the impacts to Silver Bow Creek.

$$C_2 = \frac{C_3(Q_1+Q_2) - C_1Q_1}{Q_2}$$

Where:
C_1 = background concentration, mg/L
C_2 = allowable discharge concentration, mg/L
C_3 = in-stream concentration limit for pollutant (from Circular WQB-7 or other appropriate standard)
Q_1 = 7Q10 = the 7-day, 10-year, low-flow value for the receiving stream (12 cfs).
Q_2 = maximum anticipated effluent discharge rate, 300 gpm (0.67 cfs).

Toxic, Carcinogenic and Harmful Parameters (metals)
Silver Bow Creek is classified as an "I" water body. The discharge limits for class "I" waters are contained in ARM 17.30.628 and WQB-7. ARM 17.30.628(2)(h)(iv) states: "Limits for toxic, carcinogenic, or harmful parameters in new discharge permits issued pursuant to the MPDES rules (ARM title 17, chapter 30, subchapter 12) are the larger of either the applicable standards specified in department Circular WQB-7, site specific standards, or one-half of the mean in-stream concentrations immediately upstream of the discharge point". Therefore, for these parameters, a mixing zone is not allowed and the

limits will need to be met at the discharge point prior to mixing with Silver Bow Creek. To determine the effluent limits the in-stream background concentrations of parameters of concern were determined from existing data (see attachments 2 and 3).

Silver Bow Creek in the area of the discharge has undergone extensive remediation in recent years, many of the pollutant concentrations in the stream have decreased during the 1990s. Therefore, much of the historic in-stream water quality data is no longer representative of current background conditions. There is an existing USGS gauging station (Station No. 12323250) approximately 5 miles upstream of the discharge point. Data from that location is used to determine the mean in-stream pollutant concentrations for most of the parameters of concern. Based on data collected by the USGS and by the Montana Bureau of Mines and Geology (MBMG) at that station, the concentrations of metals and other constituents in the stream have been comparatively stable since 1998 (see attachment 1). Therefore, for the parameters that have been measured in-stream since 1998, the background concentration is based on the data collected since 1998. Pre-1998 data from the Department's STOREASE data base was used when it was available for those parameters that have not been measured since 1998 (see attachment 2). A few of the toxic, carcinogenic, or harmful parameters that are expected in the effluent did not have any available in-stream data. The effluent limits for those parameters were based on the applicable water quality standard in WQB-7 (September, 1999). The permit will require in-stream monitoring in Silver Bow Creek upgradient of outfall 001 to monitor for changes in water quality, water quality changes may require modifications of the permit limits and monitoring requirements.

Table 3 uses the available data for the raw water quality used by the facility (Silver Lake water) and determines the reasonable potential multiplying factors based on Table 3-2 of the Technical Support Document for Water-Quality Based Toxics Control (EPA, 1991). Table 3-2 uses a 95% confidence level and 95% probability basis. Based on the maximum potential effluent concentration in Table 3, the determination of whether an effluent limit is necessary for outfall 001 is presented in Table 4.

Table 3: Determination of Maximum Potential Effluent Concentrations for Toxic, Carcinogenic and Harmful Parameters – Outfall 001

Parameter	Number of Samples of Raw Water Quality (Silver Lake)	Reasonable Potential Multiplying Factor[1], [2]	Anticipated Effluent Concentration (mg/L)[3]	Maximum Potential Effluent Concentration (mg/L)[4]
Total residual chlorine	none	unknown	unknown	unknown
Aluminum, dissolved	1[5]	6.2	0.180	1.12
Antimony, total recoverable	2	3.8	<0.0319	<0.12
Arsenic, total recoverable	2	3.8	0.012	0.0456
Barium, total recoverable	2	3.8	0.354	1.35
Beryllium, total recoverable	2	3.8	<0.0086	<0.033
Cadmium, total recoverable	2	3.8	<0.00045	<0.0017
Chromium, total recoverable	2	3.8	<0.0265	<0.1
Copper, total recoverable	1[5]	6.2	0.024	0.15
Fluoride, total recoverable	2	3.8	3.958	15
Lead, total recoverable	1	6.2	<0.0043	<0.027
Mercury, total recoverable	2	3.8	<0.0011	<0.0042

Parameter	Number of Samples of Raw Water Quality (Silver Lake)	Reasonable Potential Multiplying Factor[1], [2]	Anticipated Effluent Concentration (mg/L)[3]	Maximum Potential Effluent Concentration (mg/L)[4]
Nickel, total recoverable	1	6.2	<0.085	<0.53
Selenium, total recoverable	2	3.8	<0.0043	<0.016
Silver, total recoverable	1[5]	6.2	0.0043	0.027
Strontium, total recoverable	3	3.0	0.871	2.6
Thallium, total recoverable	1	6.2	<0.01595	<0.099
Zinc, total recoverable	1[5]	6.2	0.117	0.725

(1) EPA recommends using a coefficient of variation of 0.6 for data sets with less than 10 data points.
(2) Factor is from Table 3-2 of Technical Support Document for Water-Quality Based Toxics Control (EPA, 1991).
(3) Values are from MPDES Permit application.
(4) This value is the product of the anticipated CES discharge concentration and the reasonable potential multiplier.
(5) Due to a lack of data these values are assumed to be one (1) to provide a conservative estimate of the multiplication factor.

Table 4: Surface Water Water Quality Based Effluent Limits Rationale for Toxic, Carcinogenic and Harmful Parameters– Outfall 001

Parameter	Maximum Potential Effluent Discharge Concentration [1] (mg/L)	WQB-7 Human Health Surface Water Standard (mg/L)	WQB-7 Chronic Aquatic Standard (mg/L)	WQB-7 Acute Aquatic Standard (mg/L)	Effluent Limit Required[2] (Y/N)
Total residual chlorine	unknown	4.0	0.011	0.019	Y
Aluminum, dissolved	1.12	N/A	0.087	0.75	Y
Antimony, total recoverable	<0.12	0.006	N/A	N/A	Y
Arsenic, total recoverable	0.0456	0.018	0.15	0.34	Y
Barium, total recoverable	1.35	2	N/A	N/A	N
Beryllium, total recoverable	<0.033	0.004	N/A	N/A	Y
Cadmium, total recoverable	<0.0017	0.005	0.0036[3]	0.0079[3]	N
Chromium, total recoverable	<0.1	0.1	N/A	N/A	Y
Copper, total recoverable	0.15	1.3	0.014[3]	0.022[3]	Y
Fluoride, total recoverable	15	4	N/A	N/A	Y
Lead, total recoverable	<0.027	0.015	0.006[3]	0.153[3]	Y
Mercury, total recoverable	<0.0042	0.00005	0.00091	0.0017	Y
Nickel, total recoverable	<0.53	0.1	0.079[3]	0.714[3]	Y
Selenium, total recoverable	<0.016	0.05	0.005	0.02	Y
Silver, total recoverable	0.027	0.035	N/A	0.0095[3]	Y
Strontium, total recoverable	2.6	4.2	N/A	N/A	N
Thallium, total recoverable	<0.099	0.0017	N/A	N/A	Y
Zinc, total recoverable	0.725	2.1	0.182[3]	0.182[3]	Y

(1) See Table 3 for calculation of the values in this column.

(2) A permit limit is required if the maximum potential effluent concentration is greater than either the human health surface water standard, the aquatic chronic standard, or the aquatic acute standard

(3) Standard is based on average hardness in Silver Bow Creek, 164 mg/L (1998-2000 data from USGS gauging station 12323250).

Based on the analysis in Table 4, the effluent limits for toxic, carcinogenic and harmful parameters for outfall 001 are listed in Table 5. Table 5 compares the applicable WQB-7 water quality limit to ½ the mean in-stream concentration in Silver Bow Creek and then lists the higher of those values as the 30-day effluent limit.

Table 5: Surface Water Quality Based Effluent Limits for Toxic, Carcinogenic and Harmful Parameters– Outfall 001

Parameter	WQB-7 (mg/L)			½ Mean In-Stream Conc.[2] (mg/L)	Permit Limit (mg/L)[1], [7]	
	Aquatic Chronic Standard	Aquatic Acute Standard	Surface Water Human Health Standard		30-Day Average	Daily Maximum[3]
Total residual chlorine	**0.011**	0.019	4.0	unknown	0.011	0.0165
Aluminum, dissolved	0.087	0.75	N/A	**0.101**	0.101	0.152
Antimony, total recoverable	N/A	N/A	**0.006**	no data	0.006	0.009
Arsenic, total recoverable	0.15	0.34	**0.018**	0.0051	0.018	0.027
Beryllium, total recoverable	N/A	N/A	**0.004**	no data	0.004	0.006
Chromium, total recoverable	N/A	N/A	**0.1**	0.1[5]	0.1	0.15
Copper, total recoverable	0.014[4]	0.022[4]	1.3	**0.0285**	0.0285	0.044
Fluoride, total recoverable	N/A	N/A	**4**	0.25	4.0	6.0
Lead, total recoverable	**0.006**[4]	0.153[4]	0.015	0.0035	0.006	0.009
Mercury, total recoverable	0.00091	0.0017	0.00005	**0.00054**[6]	0.00054	0.0008
Nickel, total recoverable	**0.079**[4]	0.714[4]	0.1	no data	0.079	0.1185
Selenium, total recoverable	**0.005**	0.02	0.05	0.0006	0.005	0.0075
Silver, total recoverable	N/A	**0.0095**[4]	0.035	0.00185	N/A	0.0095
Thallium, total recoverable	N/A	N/A	**0.0017**	no data	0.0017	0.0026
Zinc, total recoverable	0.182[4]	0.182[4]	2.1	**0.231**	0.231	0.347

(1) See the definitions in Part I.A of the permit for explanation of terms.

(2) Values in this column are based on data collected at USGS gauging station 12323250 between 1998-2000, unless other wise noted.

(3) The daily maximum is based on a factor of 1.5 times the 30-day limit.

(4) Standard is based on average hardness in Silver Bow Creek, 164 mg/L (1998-2000 data from USGS gauging station 12323250).

(5) Based on one sample collected in 1970 (not collected at USGS gauging station)

(6) Based on 15 samples collected in 1971 (not collected at USGS gauging station)

(7) Rationale for these permit limits is ARM 17.30.628(2)(h)(iv) and WQB-7.

Bold values indicate the standard used for determining Permit limit.

Total Suspended Solids (TSS)

ARM 17.30.628(2)(f) prohibits an increase above naturally occurring concentrations which will or are likely to create a nuisance or render the waters harmful, detrimental or injurious to public health, recreation, safety, welfare, livestock, wild animals, birds, fish or other

wildlife. Silver Bow Creek is listed as impaired on the 1996 303(d) list due to siltation. The technology-based limit for TSS will protect against siltation-related water quality problems. As additional data is collected in Silver Bow Creek upstream of the discharge, the permit limit may be modified.

Total Dissolved Solids (TDS)

The existing background concentration of TDS in Silver Bow Creek is 306 mg/L (see attachment 1). The effluent concentration is anticipated to be 1,879 mg/L. The narrative water quality standard for total dissolved solids will be set at 500 mg/L (ARM 17.30.628(h)(i)). TDS at this concentration will not affect beneficial uses. The effluent limit is calculated below:

Where:
C_1 = background TDS concentration = 306 mg/L
C_2 = effluent limit
C_3 = in-stream concentration limit for TDS = 500 mg/L (narrative standard)
Q_1 = 7Q10 = 12 cfs
Q_2 = 300 gpm = 0.67 cfs

$$C_2 = \frac{500(12 + 0.67) - 306(12)}{0.67} = 3{,}974 \text{ mg/L}$$

Because the calculated effluent limit is above the anticipated discharge concentration, an effluent limit for TDS will not be set.

Sulfate

The background concentration of sulfate in Silver Bow Creek is 86 mg/L (see attachment 1). The effluent concentration is anticipated to be 1,037 mg/L. The narrative water quality standard for sulfate will be set at 250 mg/L (ARM 17.30.628(h)(i)). Sulfate at this concentration will not affect any beneficial uses. The effluent limit is calculated below:

Where:
C_1 = background sulfate concentration = 86 mg/L
C_2 = effluent limit
C_3 = in-stream concentration limit for sulfate = 250 mg/L (narrative standard)
Q_1 = 7Q10 = 12 cfs
Q_2 = 300 gpm = 0.67 cfs

$$C_2 = \frac{250(12 + 0.67) - 86(12)}{0.67} = 3{,}187 \text{ mg/L}$$

Because the calculated effluent limit is above the anticipated discharge concentration, an effluent limit for sulfate will not be set.

Nutrients (Nitrate+Nitrite and Orthophosphorus)

Pursuant to Section 525, a comprehensive water quality analysis of the Clark Fork-Pend Oreille watershed was initiated in 1993. One of the goals of this program was to restore beneficial uses and eliminate nuisance algal growth in the Clark Fork from Warm Springs Creek to the Flathead River confluence. A Voluntary Nutrient Reduction Program (VNRP) was signed in 1998 [Tri-State Implementation Council 1998] involving several major nutrient discharges and the states of Montana, Idaho and Washington. This

Program limits the discharge of nutrient (nitrogen and phosphorus) to the Clark Fork River during the 'critical season' (June 21 to September 21). This plan was submitted and approved by EPA pursuant to section 303(d) of the Federal Clean Water Act as a TMDL. Because the TMDL requires that nutrient loads in the basin be reduced, no new nutrient discharges can be allowed during this period.

Discharge from this outfall will not be allowed during the summer months (May 1 through September 30) when the impacts of additional nutrients will be harmful to Silver Bow and the Upper Clark Fork Basin.

Temperature

The water quality standard for temperature in Silver Bow Creek is narrative [ARM 17.30.628(2)(e)] to protect beneficial uses. The highest anticipated temperature that would be discharged from the facility is approximately 90 degrees F during the summer months. During the winter months the discharge temperature would be approximately 70 degrees F. To determine impacts during the two warmest months (April and October) that outfall 001 will be used, the mean in-stream temperature (at USGS gauging station 12323250) during the months of April and October is used (see attachment 1). The effluent temperature during the months of April and October was estimated at 80 degrees F (based on the MPDES application estimates of 90 degrees F in the summer and 70 degrees F in the winter) for the purposes of determining effluent limits. To determine the greatest winter-time temperature impacts, the average in-stream temperature (at USGS gauging station 12323250) during the three coldest months of the year in Butte are used (December, January and February). The three coldest months are based on the 30-year air temperature average at the Bert Mooney airport station as reported by the National Climatic Data Center. The in-stream water temperature increase is calculated using the following formula:

$$calculated\ temperature\ increase = \frac{T_s Q_s + T_d Q_d}{Q_s + Q_d} - T_s$$

Where:
- Q_s = receiving water flow (7Q10 = 12 cfs)
- Q_d = discharge flow from Outfall 001 (use maximum anticipated flows: spring/fall = 300 gpm/0.67 cfs; winter = 282 gpm/0.63 cfs)
- T_s = receiving water temperature, before mixing with discharge, °F (spring/fall = 50.1 °F; winter = 41.9 °F)
- T_d = discharge temperature, °F (spring/fall = 80°F {estimated from application}; winter = 70°F)

Winter (November through March) Temperature Increase:

$$temperature\ increase = \frac{T_s Q_s + T_d Q_d}{Q_s + Q_d} - T_s = \frac{41.9(12) + 70(0.63)}{(12 + 0.63)} - 41.9 = 1.4°F$$

Spring/Fall (April and October) Temperature Increase:

$$temperature\ increase = \frac{T_s Q_s + T_d Q_d}{Q_s + Q_d} - T_s = \frac{50.1(12) + 80(0.67)}{(12 + 0.67)} - 50.1 = 1.6°F$$

Both temperature increases are approximately 1.5 times higher than the allowable increases for B-1, B-2, C-1 and C-2 waters. However, because the discharge at outfall 001 will only occur during months (October through April) when elevated temperatures and low DO concentrations are not as significant a problem as during warmer months, effluent limits will be set at 80 degrees F for the months of April and October, and 70 degrees for the months of November through March (ARM 17.30.628(2)(e)).

Dissolved Oxygen (DO)

Because the discharge at outfall 001 will only occur during months when low DO concentrations are not typically a problem (October through April), an effluent limit will not be set in the permit. In-stream monitoring of DO will be required to assess the potential for impacts. This data will be used to reassess effluent limits during the next permit renewal.

Oil and Grease

The general discharge prohibitions require that the limit for oil and grease shall not exceed 10 mg/L [ARM 17.30.637(1)(b)].

Whole Effluent Toxicity (WET) Limits

Montana Water Quality Standards require receiving waters to be free from substances that will cause toxic or harmful conditions to human, animal, plant, or aquatic life [ARM 17.30.637(1)(d)]. WET limits are included in permits to measure aggregate toxicity of the effluent, detect the presence of unknown or unregulated toxicants, such as chemical reagents or the presence of synergistic effects in the effluent and assess the bioavailability of toxicants in the wastewater. Montana regulations allow exceedance of acute standards in a portion of the mixing zone, provided that the minimal initial dilution would not threaten or impair existing beneficial uses [ARM 17.30.507(1)(b)].

Acute toxicity is defined as 50 percent or more mortality at any effluent concentration, or in terms of toxicity units 0.3 TU_a [EPA 1991]. Because Silver Bow Creek is impaired and is likely toxic to aquatic organisms upstream of the point of discharge, no additional toxicity would be allow, i.e. the upstream value is 0.3 TU_a. The WET limit is calculated from the following:

$$WLA_a = 0.3TU_a + D_m \text{ x } (0.3TU_a - TU_{s)}$$

Where:

WLA_a = wasteload allocation, in TU_a,
D_m = minimum probable initial dilution (12 cfs)
TU_s = instream toxicity, assume 0.3 (i.e. toxic conditions)

Therefore, the permit limit for toxicity will be set at 0.3 TU_a (ARM 17.30.637(1)(d)).

In-stream WET monitoring will be required to determine the toxicity of Silver Bow Creek. The results may be used to reassess effluent limits during the next permit renewal.

(ii) Sheep Gulch – Outfall 002

At the outfall location, the discharge must comply with the general treatment standards and general prohibitions of ARM 17.30.635 and 17.30.637.

(a) Surface Water

B-1 water quality standards (ARM 17.30.623) apply to the perennial section of Sheep Gulch below the confluence with the West Fork Sheep Gulch, which is approximately 1 mile below the outfall location. Effluent limits based on the B-1 water quality standards will not be set in the permit due to uncertainty regarding the volume of effluent that will enter the perennial section of Sheep Gulch and uncertainty regarding the chemical and biological processes that may effect the effluent chemical characteristics between the discharge point and the confluence of Sheep Gulch and West Fork Sheep Gulch. Monitoring will be required immediately prior to the confluence of Sheep Gulch and West Fork Sheep Gulch to determine if effluent limits need to be set during the permit renewal or sooner pursuant to the reopener section of the permit. In addition, Whole Effluent Toxicity testing for the effluent will be required.

Toxic Carcinogenic and Harmful Parameters

Monitoring of the effluent in Sheep Gulch above the confluence with West Fork Sheep Gulch will be used to determine if effluent limits need to be set for toxic, carcinogenic and harmful parameters in the permit.

Oil and Grease

The general discharge prohibitions require that the limit for oil and grease shall not exceed 10 mg/L [ARM 17.30.637(1)(b)].

TSS

Conformance with the TBELs for TSS meets the requirements for WQBELs [ARM 17.30.635(3)].

TDS

Because Sheep Gulch is an ephemeral stream the existing uses consist of livestock and wild life watering. The TDS of the discharge water (anticipated to be 1,879 mg/L) will not impact these uses. Therefore an effluent limit will not be required.

Sulfate

Because Sheep Gulch is an ephemeral stream the existing uses consist of livestock and wild life watering. The sulfate in the discharge water (anticipated to be 1,037 mg/L) will not impact these uses. Therefore an effluent limit will not be required.

Iron

The general treatment standards and general prohibitions of ARM 17.30.635 and 17.30.637 require protection of existing uses. Because this is an ephemeral stream the existing uses

consist of livestock and wild life watering. The iron in the discharge water (anticipated to be 0.271 mg/L) will not impact these uses. Therefore an effluent limit will not be required.

Manganese

The general treatment standards and general prohibitions of ARM 17.30.635 and 17.30.637 require protection of existing uses. Because this is an ephemeral stream the existing uses consist of livestock and wild life watering. The manganese in the discharge water (anticipated to be 0.032 mg/L) will not impact these uses. Therefore an effluent limit will not be required.

Temperature

The water that exists in the perennial section of Sheep Gulch (where B-1 surface water standards apply) is from the ASiMI discharge. The source of that water is cooling water similar to the source of the effluent from the CES discharge (the discharge volumes are also similar). The distance between the ASiMI discharge and the CES discharge to the point where both effluent streams mix is approximately 1 mile. Therefore, the temperature of both effluent streams should be roughly equivalent and a temperature limit is not necessary.

Nitrate + Nitrite

The anticipated discharge concentration of nitrate+nitrite is 1.2 mg/L. The surface water numeric standard for nitrate+nitrite is 10 mg/L. The Department does not believe that applying the narrative standard in ARM 17.30.637(1)(e) is necessary for this discharge into an effluent dependent stream. There is no reasonable potential for the standard to be exceeded, therefore an effluent limit will not be required.

Phosphorus

The anticipated discharge concentration of phosphorus is 6.2 mg/L. The Department does not believe that applying the narrative standard in ARM 17.30.637(1)(e) is necessary for this discharge into an effluent dependent stream. Therefore, an effluent limit will not be required

Whole Effluent Toxicity (WET)

Montana Water Quality Standards require receiving waters to be free from substances that will cause toxic or harmful conditions to human, animal, plant, or aquatic life [ARM 17.30.637(1)(d)]. WET limits are included in permits to measure aggregate toxicity of the effluent, detect the presence of unknown or unregulated toxicants, such as chemical reagents or the presence of synergistic effects in the effluent and assess the bioavailability of toxicants in the wastewater.

Acute toxicity is defined as 50 percent or more mortality at any effluent concentration, or in terms of toxicity units 0.3 TU_a [EPA 1991]. Because Sheep Gulch in the area of the discharge, is ephemeral there is no water available for dilution, therefore the WET limit will be set at the limit for toxicity 0.3 TU_a (ARM 17.30.637(1)(d)) at the outfall.

(b) Ground Water

Toxic, Carcinogenic and Harmful Parameters

As discussed in Section D.2., the nondegradation requirements and WQB-7 ground water standards apply to the ground water beneath Sheep Gulch. The discharge at outfall 002 is initially a surface water discharge to Sheep Gulch, however, due to the porous nature of the sediments, some of the effluent will infiltrate to the ground water. Estimating the amount of infiltration that will occur is difficult without site specific information. The permit will require monitoring of flow in Sheep Gulch to better estimate the volume of effluent infiltration to determine if limits are necessary.

Existing background ground water concentrations for the parameters of concern in the discharge are based on three wells. ASiMI has been conducting quarterly monitoring of a background well (GW-1) since 1998. In addition, two background wells on the Rhodia property (MW97-1 and MW97-2) were also monitored on two dates in 1997 and 1998 (see attachment 3). The permit will require ground water monitoring from a new well (CESMW-1) in the aquifer beneath Sheep Gulch prior to the initiation of discharges from outfall 002. The data from CESMW-1 will be used to establish background conditions. Determining background ground water conditions is necessary to determine compliance with nondegradation criteria for certain parameters. The existing ground water quality data from GW-1, MW97-1 and MW97-2 is not statistically or spatially adequate to provide sufficient information to determine nondegradation limits.

In conformance with the nonsignificance criteria of ARM 17.30.715(3), the predicted concentration of arsenic in the discharge is less than the receiving water (Table 6). However, the increased flow may mobilize arsenic from the soil resulting in an increase in arsenic in the ground water. The magnitude and duration of this increase is difficult to predict due to variations in the soil beneath the discharge and the effluent characteristics. The Department will require monitoring to assess the change in water quality and determine if a limit is necessary.

Based on this information, the Department believes that a short-term increase in arsenic is nonsignificant under the authority of ARM 17.30.715(3). The Department finds that allowing a short-term increase is consistent with the guidance in 75-5-301(5)(c), MCA as required by ARM 17.30.715(3). The Department will monitor the change in arsenic concentration in ground water, if any, and determine additional controls are necessary. For toxic and harmful parameters, the permit will require monitoring at the end of the mixing zone for compliance with the nondegradation criteria listed in Table 6.

Table 6: Toxic, Carcinogenic and Harmful Parameters Water Quality Standards and Nondegradation Criteria at the end of the Ground Water Mixing Zone – Outfall 002

Parameter	Anticipated Effluent Discharge Concentration (mg/L)	Measured Ground Water Concentration at End of the Mixing Zone (mg/L)[1]	WQB-7 Human Health Ground Water Standard (mg/L)	Non-degradation Requirement[2] (mg/L)	WQB-7 Required Reporting Value (mg/L)
Aluminum, dissolved	0.18	<0.1	N/A	N/A	0.1
Antimony, dissolved	<0.0319	<0.04	0.006	0.0009	0.003
Arsenic, dissolved	0.012	0.0215	0.02	[3], [4]	0.003
Barium, dissolved	0.354	<0.1	2	0.3	0.005
Beryllium, dissolved	<0.0086	<0.001	0.004	[3]	0.001
Cadmium, dissolved	<0.0005	<0.001	0.005	0.00075	0.0001
Chromium, dissolved	<0.0265	<0.01	0.1	0.015	0.001
Copper, dissolved	0.024	<0.01	1.3	0.195	0.001
Fluoride, dissolved	3.96	No data	4	0.6	0.1
Iron, dissolved	0.271	<0.01	N/A	N/A	0.01
Lead, dissolved	<0.0043	<0.01	0.015	0.00225	0.003
Manganese, dissolved	0.032	N/A	N/A	N/A	0.005
Mercury, dissolved	<0.0011	0.0043	0.002	[3]	0.0006
Nickel, dissolved	<0.085	<0.01	0.1	0.015	0.02
Selenium, dissolved	<0.0043	0.01	0.05	0.0075	0.001
Silver, dissolved	0.0043	<0.005	0.035	0.00525	0.003
Strontium, dissolved	0.871	2.1	4.2	0.63	N/A
Thallium, dissolved	<0.01595	<0.1	0.002	0.0003	0.003
Zinc, dissolved	0.117	<0.1	2.1	0.315	0.01

(1) Concentrations based on ground water monitoring conducted on Rhodia Inc. property (Barr, 1999). Concentrations reported as less than the laboratory detection level were used in calculating this value at the "less than" value. If any of the measured concentrations were less than the laboratory detection level, the concentration in this table is reported as "less than".

(2) The nondegradation requirement for toxins (which includes all the parameters in the list except for arsenic, beryllium, mercury, iron and manganese) is that the concentration at the end of the mixing zone is less than the WQB-7 trigger level or less than 15% of the lowest applicable standard (which is the ground water human health standard). If the WQB-7 required reporting value (RRV) is less than the nondegradation limit, any concentrations reported as less than the RRV will be considered to be less than the nondegradation limit.

(3) The effluent concentration at the outfall may not exceed the background concentration of the receiving water (ARM 17.30.715(1)(b)) as determined at ground water well (CESMW-1).

(4) The nondegradation criterion is no increase above background (ARM 17.30.715(1)(b)) except that the Department has determined that a short-term increase pursuant to ARM 17.30.715(3) is not significant, see text.

N/A Not Applicable

TDS
Based on the measured concentrations in the two ground water wells (MW97-10 and MW97-11) on the Rhodia Inc. property below the mixing zone, the average TDS concentration is 2,330 mg/L (Barr, 1999). The anticipated CES discharge concentration for TDS is 1,879 mg/L. Based on that information the discharge will not cause an increase in the TDS concentration below the mixing zone. Therefore, an effluent limit for TDS will not be required.

Sulfate
Based on the measured concentrations in the two ground water wells (MW97-10 and MW97-11) on the Rhodia Inc. property below the mixing zone, the average sulfate concentration is 1,195 mg/L (Barr, 1999). The anticipated CES discharge concentration for TDS is 1,037 mg/L. Based on that the information the discharge will not cause an increase in the sulfate concentration below the mixing zone. Therefore, an effluent limit for sulfate will not be required.

Nitrate + Nitrite
The anticipated discharge concentration of nitrate+nitrite is 1.2 mg/L. The ground water standard for nitrate+nitrite is 10 mg/L. There is no reasonable potential for the standard to be exceeded, therefore an effluent limit will not be required.

Orthophosphorus
There is no ground water standard for phosphorus. Due to the large area over which the discharge will infiltrate to the ground, there will be sufficient soil available to immobilize the phosphorus and retard phosphorus migration into surface waters. Therefore, an effluent limit will not be required.

(iii) Ground Water – Outfall 003

Outfall 003 will consist of land application via spray irrigation. The application rate will be maintained at or below agronomic uptake rate for the nutrients in the discharge. Those nutrients consist of inorganic nitrogen (nitrate+nitrite and ammonia) and orthophosphorus. In addition, the application rate will be maintained at or below the hydraulic loading rate of this soil (EPA, 1981) to avoid creating saturated conditions in the soil. By meeting these conditions the migration of nutrients and metals into the ground water will be minimized or eliminated.

The restrictions and requirements for municipal wastewater land application in DEQ-2 (Appendix B), EPA (1981) and EPA (1992) must be met. The requirements for municipal wastewater land application are applicable to the CES discharge because the quality of the CES discharge is similar or better than typical municipal wastewater for the parameters of concern. These parameters are discussed in detail below.

Metals
Under the proper conditions, metals are adsorbed and absorbed by soil particles (primarily clay particles due to the negative electrical charges). Based on soil tests in the land application area, the soils in this area are primarily sandy loams with a high percentage of silt (40-60%) and typically less than 10% of clay (Cascade Earth Sciences, September 10, 2001). This finer grained soil is better suited for sorption of metals than

the soils used by EPA in their Guidelines for Water Reuse (EPA, 1992), which is based on sandier soils.

Table 19 in the Guidelines for Water Reuse (EPA, 1992) includes guidelines for the maximum concentration of metals in land application water to avoid impacts to ground water. The estimated concentrations in the CES effluent meets those guidelines for all of the metals listed except for Fluoride. The anticipated CES discharge concentration for Fluoride (3.94 mg/L) is less than the ground water human health standard (4.0 mg/L). Therefore, in the unlikely event that the discharge does migrate to ground water it should not create any exceedances of the ground water standards. However, if Fluoride migrated to the ground water at the concentrations equal to the discharge concentration (which is unlikely with the proposed discharge method and the likely sorption of a significant amount of Fluoride to soil particles), the ground water Fluoride concentration would increase by an amount greater than the nondegradation trigger value (0.005 mg/L), and would be considered significant degradation. Ground water monitoring beneath this outfall will be required to determine if degradation is occurring. If degradation is documented for any parameter, the concentration in the effluent will need to be reduced or the irrigation management will need to be revised to eliminate the degradation.

The EPA guidelines for land application (1981, 1992) stress that metal sorption will not occur if soil pH is below 6.5. According to the 16 pH tests conducted on three test pits in the land application area, the pH of the soil is above 6.8 except for two samples collected at the surface (depths of 0-4 inches and 0-5 inches) of two of the test pits. This indicates that the soil is generally suitable for metal sorption, but the permit will require soil pH monitoring to assure the proper pH is maintained. The soils may have to be treated on a regular basis to maintain the proper pH.

If compliance with EPA guidelines for land application and water reuse is maintained there is a low potential for exceedances of metal standards in ground water. Therefore, WQBELs will not be required for the metals in the discharge. However, the discharge concentrations for metals in the MPDES permit application are approximate levels because there is no existing comparable facility using raw water of comparable quality to use as a benchmark. Therefore, monitoring of all metals in the effluent will be required to insure that discharge concentrations do not exceed the EPA guidelines. Ground water monitoring will be required to insure migration of contaminants to the ground water does not occur.

The permittee will be required to submit an operation and maintenance plan to the Department before the discharge to Outfall 003 begins that documents how the discharge will meet all of the EPA wastewater guidelines and requirements to avoid impacts to the ground water.

TDS

If the land application is conducted at or below the hydraulic loading rate in accordance with EPA guidance (EPA, 1981), then TDS will likely not impact ground water, and an effluent limit is not necessary. Ground water monitoring will be required to insure breakthrough and migration of TDS to the ground water does not occur.

Total Suspended Solids (TSS)
There are no water quality based TSS standards for ground water, a WQBEL effluent limit will not be set.

Fecal Coliform
Fecal coliforms should not be an issue in this discharge. The only source of fecal coliforms will be the naturally occurring fecal coliforms in the raw water from Silver Lake. Those natural concentrations will be reduced prior to discharge by the chlorination process in the facility.

Biological Oxygen Demand (BOD) / Chemical Oxygen Demand (COD)
BOD and COD do not have any ground water standards and are primarily related to municipal wastewater characteristics that are not applicable to the processes at this facility.

G. Final Wastewater Effluent Limitations
For those parameters with permit limits that require a monthly monitoring schedule, and a single sample is collected during any one month, that value must comply with both the 30-day average and instantaneous maximum permit limits.

Outfall 001: Silver Bow Creek

The final effluent limits for outfall 001 are listed in Table 7. The effluent limits apply to the effluent at the discharge point before mixing with Silver Bow Creek. When there are applicable water quality-based and technology-based limits for the same parameter, the final limit is based on the more restrictive of the two.

Table 7: Final Effluent Limits – Outfall 001(1)

Parameter	Permit Limit		Allocated Annual Average Load (lb/day)(3)	Rationale
	30-Day Average	Daily Maximum(2)		
Total Suspended Solids (TSS), mg/L	30	100	108	40 CFR 423.15(c)
Oil and Grease, mg/L	10	15	36.0	ARM 17.30.637(1)(b)
Total Residual Chlorine, mg/L	0.011	0.0165	0.04	ARM 17.30.628(2)(h)(iv)
Free Available Chlorine, mg/L(4)	0.2	0.5	0.72	40 CFR 423.15(j)(1)
Temperature (April and October), °F	N/A	80	N/A	ARM 17.30.628(2)(e)
Temperature (November – March), °F	N/A	70	N/A	ARM 17.30.628(2)(e)
Aluminum, dissolved, mg/L	0.101	0.152	0.364	ARM 17.30.628(2)(h)(iv)
Antimony, total recoverable, mg/L	0.006	0.009	0.022	ARM 17.30.628(2)(h)(iv)
Arsenic, total recoverable, mg/L	0.018	0.027	0.065	ARM 17.30.628(2)(h)(iv)
Beryllium, total recoverable, mg/L	0.004	0.006	0.014	ARM 17.30.628(2)(h)(iv)
Chromium, total recoverable, mg/L	0.1	0.15	0.36	ARM 17.30.628(2)(h)(iv)
Copper, total recoverable, mg/L	0.0285	0.044	0.10	ARM 17.30.628(2)(h)(iv)

Table 7: Final Effluent Limits – Outfall 001(1)

Parameter	Permit Limit		Allocated Annual Average Load (lb/day)(3)	Rationale
	30-Day Average	Daily Maximum(2)		
Fluoride, total recoverable, mg/L	4.0	6.0	14.4	ARM 17.30.628(2)(h)(iv)
Lead, total recoverable, mg/L	0.006	0.009	0.022	ARM 17.30.628(2)(h)(iv)
Mercury, total recoverable, mg/L	0.00054	0.0008	0.002	ARM 17.30.628(2)(h)(iv)
Nickel, total recoverable, mg/L	0.079	0.1185	0.29	ARM 17.30.628(2)(h)(iv)
Selenium, total recoverable, mg/L	0.005	0.0075	0.018	ARM 17.30.628(2)(h)(iv)
Silver, total recoverable, mg/L	N/A	0.0095	0.034	ARM 17.30.628(2)(h)(iv)
Thallium, total recoverable, mg/L	0.0017	0.0026	0.006	ARM 17.30.628(2)(h)(iv)
Zinc, total recoverable, mg/L	0.231	0.347	0.83	ARM 17.30.628(2)(h)(iv)
Whole Effluent Toxicity (WET), TU_a	N/A	0.3	N/A	ARM 17.30.637(1)(d)

(1) See the definitions in Part I.A of the permit for explanation of terms.
(2) The daily maximum is based on a factor of 1.5 times the 30-day limit (except for TSS, free available chlorine, and temperature).
(3) Values based on the 30-day average limit and the maximum anticipated discharge rate (300 gpm).
(4) Free available chlorine may not be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available chlorine at any one time.
N/A Not applicable.

The pH of the discharge shall remain equal to or above 6.5 standard units (ARM 17.30.628(2)(c)), and shall remain equal to or below 9.0 standard units [40 CFR423.15(a)].

There shall be no discharge of floating solids or visible foam in other than trace amounts (ARM 17.30.637(1)(b)).

There shall be no discharge, which causes visible oil sheen in the receiving stream (ARM 17.30.637(1)(b)).

There shall be no discharge of wastewater, which reacts or settles to form an objectionable sludge deposit or emulsion beneath the surface of the receiving stream or upon adjoining shorelines (ARM 17.30.637(1)(a)).

There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid [40 CFR 423.15(b)].

The TMDL waste load allocations for the discharge to outfall 001 are listed in Table 8.

Table 8: TMDL Loading Analysis

Pollutant	WLA[1] (lbs/day)			TMDL (lbs/day)			Averaging Period
	Effluent Flow (cfs)	Effluent Conc. (mg/L)	Load (lbs/day)	Down-stream Flow[2] (cfs)	Downstream Conc. (mg/L) (WQS)[3]	Load (lbs/day)	
Arsenic, total recoverable (mg/L)	0.67	0.012	0.043	13	0.15	10.5	96 hours
Cadmium, total recoverable (mg/L)	0.67	<0.000 45	0.0016	13	0.0036[4]	0.25	96 hours
Copper, total recoverable (mg/L)	0.67	0.024	0.086	13	0.014[4]	0.98	96 hours
Iron, total recoverable (mg/L)	0.67	0.271	0.98	13	0.3[5]	21.0	96 hours
Lead, total recoverable (mg/L)	0.67	<0.004 3	0.015	13	0.006[4]	0.42	96 hours
Manganese, total recoverable (mg/L)	0.67	0.032	0.12	13	0.05[5]	3.5	96 hours
Silver, total recoverable (mg/L)	0.67	0.0043	0.015	13	0.0095[4]	0.67	1 hour
Zinc, total recoverable (mg/L)	0.67	0.117	0.42	13	0.182[4]	12.8	96 hours
Total Nitrogen (mg/L)	0.67	1.2	4.32	13	0.3[7]	21.0	30 days
Total Phosphorus (mg/L)	0.67	6.2	22.3	13	0.02[7]	1.4	30 days
TSS (mg/L)	0.67	45.223	163	13	--[6]	--	--

(1) Although the WLA is calculated in terms of lbs/day, the final effluent limitation does not need to be expressed in terms of lbs/day, unless limitation of the pollutant needs to be in terms of loading based on state or federal procedures for that pollutant.
(2) Based on 30-day 10-year low flow at USGS gauging station 12323250 (Silver Bow Creek below Blacktail Creek).
(3) Concentration based on WQB-7 (September 1999) chronic aquatic standard (or the acute aquatic standard when there is no chronic aquatic standard) .
(4) Standard is based on average hardness in Silver Bow Creek, 164 mg/L (1998-2000 data from USGS gauging station 12323250).
(5) There is no aquatic standard for manganese or iron, the secondary maximum contaminant level is used.
(6) TSS does not have a water quality standard.
(7) These concentrations are based on the Water Quality Targets for the Clark Fork VNRP.

Outfall 002: Sheep Gulch

The final effluent limits for outfall 002 are listed In Table 9. When there are applicable water quality-based and technology-based limits for the same parameter, the final limit is based on the more restrictive of the two. The effluent limits apply to the effluent at the discharge point before entering Sheep Gulch.

Table 9: Final Effluent Limits – Outfall 002[1]

Parameter	Permit Limit		Allocated Annual Average Load (lb/day)[2]	Rationale
	30-Day Average	Daily Maximum		
Total Suspended Solids (TSS) mg/L	30	100	108.1	40 CFR 423.15(c)
Oil and Grease, mg/L	10	15[3]	36.0	ARM 17.30.637(1)(b)
Free Available Chlorine, mg/L[4]	0.2	0.5	0.72	40 CFR 423.15(j)(1)
Chromium, total recoverable, mg/L	0.2	0.2	0.72	40 CFR 423.15(j)(1)
Zinc, total recoverable, mg/L	1.0	1.0	3.6	40 CFR 423.15(j)(1)
Whole Effluent Toxicity (WET), TU_a	N/A	0.3	N/A	ARM 17.30.637(1)(d)

(1) See the definitions in Part I.A of the permit for explanation of terms.

(2) Values based on the 30-day average limit and the maximum anticipated discharge rate (300 gpm).
(3) The daily maximum is based on a factor of 1.5 times the 30-day limit.
(4) Free available chlorine may not be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available chlorine at any one time.
N/A Not Applicable

The pH of the discharge shall remain equal to or above 6.5 standard units (ARM 17.30.628(2)(c)), and shall remain equal to or below 9.0 standard units [40 CFR423.15(a)].

There shall be no discharge of floating solids or visible foam in other than trace amounts (ARM 17.30.637(1)(b)).

There shall be no discharge, which causes visible oil sheen in the receiving stream (ARM 17.30.637(1)(b)).

There shall be no discharge of wastewater, which reacts or settles to form an objectionable sludge deposit or emulsion beneath the surface of the receiving stream or upon adjoining shorelines (ARM 17.30.637(1)(a)).

There shall be no discharge of polychlorinated biphenyl compounds such as those commonly used for transformer fluid [40 CFR 423.15(b)].

Outfall 003: Ground Water

The final effluent limits for outfall 003 are listed in Table 10. The effluent limits apply to the effluent at the discharge point before being applied to the ground. Because the discharge will not impact ground water, all of the effluent limits are technology based.

Table 10: Final Effluent Limits – Outfall 003

Parameter	Permit Limit[1]		Allocated Annual Average Load (lb/day)[2]	Rationale
	30-Day Average	Daily Maximum		
Total Suspended Solids (TSS) mg/L	30	100	108.1	40 CFR 423.15(c)
Oil and Grease, mg/L	15	20	54.0	40 CFR 423.15(c)
Free Available Chlorine, mg/L[3]	0.2	0.5	0.72	40 CFR 423.15(j)(1)
Chromium, total recoverable, mg/L	0.2	0.2	0.72	40 CFR 423.15(j)(1)
Zinc, total recoverable, mg/L	1.0	1.0	3.6	40 CFR 423.15(j)(1)

(1) See the definitions in Part I.A of the permit for explanation of terms.
(2) Values based on the 30-day average limit and the maximum anticipated discharge rate (300 gpm).
(3) Free available chlorine may not be discharged from any unit for more than two hours in any one day and not more than one unit in any plant may discharge free available chlorine at any one time.

H. Self-Monitoring Requirements

1. Wastewater Monitoring

Outfalls 001 and 002

As a minimum, upon the effective date of this permit, the constituents shall be monitored at the frequency and with the type of measurement indicated in Table 11; samples or measurements shall be representative of the volume and nature of the monitored discharge.

Table 11: Effluent Monitoring – Outfalls 001 & 002

Parameter[1]	**Frequency[6]**	**Type[2]**
Effluent Flow Rate[3], mgd	Continuous	Recorder
DO, mg/L	Monthly	Grab
BOD_5, mg/L	Monthly	Grab
COD, mg/L	Monthly	Grab
Total Suspended Solids (TSS), mg/L	Monthly	Grab
Total Dissolved Solids (TDS), mg/L	Monthly	Grab
Sulfate, mg/L	Monthly	Grab
Ammonia (as N), mg/L	Monthly	Grab
Nitrate + Nitrite (as N), mg/L	Monthly	Grab
Total inorganic nitrogen (as N)[4], mg/L	Monthly	Calculated
Orthophosphorus, mg/L	Monthly	Grab
Temperature, degrees F	Daily	Grab
pH, standard units	Daily	Grab
Oil and Grease[5], mg/L	Daily	Visual
Total Residual Chlorine, mg/L	Daily	Grab
Free Available Chlorine, mg/L	Daily	Grab
Whole Effluent Toxicity (WET), TU_a	Quarterly	Composite/Grab
Aluminum, dissolved, mg/L	Weekly	Composite
Antimony, total recoverable/dissolved[8], mg/L	Weekly	Composite
Arsenic, total recoverable/dissolved[8], mg/L	Weekly	Composite
Barium, total recoverable/dissolved[8], mg/L	Weekly	Composite
Beryllium, total recoverable/dissolved[8], mg/L	Weekly	Composite
Cadmium, total recoverable/dissolved[8], mg/L	Weekly	Composite
Chromium, total recoverable/dissolved[8], mg/L	Weekly	Composite
Copper, total recoverable/dissolved[8], mg/L	Weekly	Composite
Fluoride, total recoverable/dissolved[8], mg/L	Weekly	Composite
Iron, total recoverable/dissolved[8], mg/L	Weekly	Composite
Lead, total recoverable/dissolved[8], mg/L	Weekly	Composite
Manganese, total recoverable/dissolved[8], mg/L	Weekly	Composite
Mercury, total recoverable/dissolved[8], mg/L	Weekly	Composite
Nickel, total recoverable/dissolved[8], mg/L	Weekly	Composite
Selenium, total recoverable/dissolved[8], mg/L	Weekly	Composite
Strontium, total recoverable/dissolved[8], mg/L	Weekly	Composite
Silver, total recoverable/dissolved[8], mg/L	Weekly	Composite

Table 11: Effluent Monitoring – Outfalls 001 & 002

Parameter[1]	Frequency[6]	Type[2]
Thallium, total recoverable/dissolved[8], mg/L	Weekly	Composite
Zinc, total recoverable/dissolved[8], mg/L	Weekly	Composite

(1) Detection limits must follow the required reporting values (RRVs) in WQB-7. Total recoverable and dissolved metals analysis shall be by the EPA series 200 method described in "Metals (Atomic Absorption Methods)", Section 4.1.4 from Methods for Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983.
(2) See the definitions in Part I.A of the permit for explanation of terms.
(3) If no discharge occurs during the reporting period, "no discharge" shall be recorded on the DMR report form.
(4) Calculated by finding the sum of nitrate+nitrite and ammonia (as N) concentrations.
(5) If a visual examination of the discharge indicates the presence of hydrocarbons, by sheen, odor, or other sign, the permittee will be required to sample for Oil and Grease for that month.
(6) If a discharge occurs at any time during the reporting period monitoring must be conducted.
(7) For discharges from outfall 001 only the total recoverable analysis is required. For discharges from outfall 002 both total recoverable and dissolved analyses are required.

(i) Whole Effluent Toxicity (WET) Limits

Starting in the first calendar quarter following the effective date of the permit, the permittee shall, at least once each calendar quarter conduct an acute static replacement toxicity test on an undiluted composite/grab sample of the effluent. Testing will employ two species per quarter. Samples shall be collected on a two day progression; i.e., if the first quarterly sample is on a Monday, the second quarterly sample shall be on a Wednesday, etc. Saturdays, Sundays and Holidays will be skipped in the progression.

The replacement static toxicity tests shall be conducted in general accordance with the procedures set out in the latest revision of Methods for Measuring the Acute Toxicity of Effluents to Freshwater and Marine Organisms, EPA-600/4-90-027 and the "Region VIII EPA NPDES Acute Test Conditions – Static Renewal Whole Effluent Toxicity". The permittee shall conduct an acute 48-hjour static renewal toxicity test using both *Ceriodaphnia sp*. and fathead minnows (*Pimephales promelas*).

Acute toxicity occurs when 50 percent or more mortality is observed for either species at any effluent concentration. If more than 10 percent control mortality occurs, the test is considered invalid and shall be repeated until satisfactory control survival is achieved unless a specific individual exception is granted by the Department. This exception may be granted if less than 10 percent mortality was observed at the dilutions containing high effluent concentrations.

If acute toxicity occurs in a routine test, an additional test shall be conducted within 30 days of the date of the initial sample. Should acute toxicity occur in the second test, testing shall occur once a month until further notified by the Department.

The quarterly test results from the laboratory shall be reported along with the Discharge Monitoring Report (DMR) form submitted for the end of the reporting calendar quarter (e.g., whole effluent results for the reporting quarter ending March 31 shall be reported with

the March DMR due April 28, with the remaining quarterly reports submitted with the June, September, and December DMRs). The format for the laboratory report shall be consistent with the latest revision of Region VIII Guidance for Acute Whole Effluent Reporting, and shall include all chemical and physical data as specified.

(ii) Toxicity Reduction Evaluation (TRE)
Toxicity Identification Evaluation (TIE)

Should acute toxicity be detected in the permittee's discharge, a TIE-TRE shall be undertaken by the permittee to establish the cause of the toxicity, locate the source(s) of the toxicity, and develop control of, or treatment for the toxicity. Failure to initiate, or conduct an adequate TIE-TRE, or delays in the conduct of such tests, shall not be considered a justification for noncompliance with the whole effluent toxicity limits contained in Part I.C.1 of the permit.

Outfall 003

As a minimum, upon the effective date of this permit, the constituents shall be monitored at the frequency and with the type of measurement indicated in Table 12; samples or measurements shall be representative of the volume and nature of the monitored discharge.

Table 12: Effluent Monitoring – Outfall 003

Parameter[1]	**Frequency**[6]	**Type**[2]
Effluent Flow Rate[3], mgd	Continuous	Recorder
Total Dissolved Solids (TDS), mg/L	Monthly	Grab
Ammonia (as N), mg/L	Monthly	Grab
Nitrate + Nitrite (as N), mg/L	Monthly	Grab
Total inorganic nitrogen (as N)[4], mg/L	Monthly	Calculated
Orthophosphorus, mg/L	Monthly	Grab
pH, standard units	Daily	Grab
Oil and Grease[5], mg/L	Daily	Visual
Total Residual Chlorine, mg/L	Daily	Grab
Free Available Chlorine, mg/L	Daily	Grab
Sodium, mg/L	Quarterly	Grab
Calcium, mg/L	Quarterly	Grab
Magnesium, mg/L	Quarterly	Grab
Potassium, mg/L	Quarterly	Grab
total Phosphorus, mg/L	Quarterly	Grab
Sulfate, mg/L	Quarterly	Grab
Chloride, mg/L	Quarterly	Grab
Bicarbonate, mg/L	Quarterly	Grab
Aluminum, dissolved, mg/L	Quarterly	Grab
Antimony, dissolved, mg/L	Quarterly	Grab
Arsenic, dissolved, mg/L	Quarterly	Grab
Barium, dissolved, mg/L	Quarterly	Grab
Beryllium, dissolved, mg/L	Quarterly	Grab
Cadmium, dissolved, mg/L	Quarterly	Grab

Table 12: Effluent Monitoring – Outfall 003

Parameter[1]	Frequency[6]	Type[2]
Chromium, dissolved, mg/L	Quarterly	Grab
Copper, dissolved, mg/L	Quarterly	Grab
Fluoride, dissolved, mg/L	Quarterly	Grab
Iron, dissolved, mg/L	Quarterly	Grab
Lead, dissolved, mg/L	Quarterly	Grab
Manganese, dissolved, mg/L	Quarterly	Grab
Mercury, dissolved, mg/L	Quarterly	Grab
Nickel, dissolved, mg/L	Quarterly	Grab
Selenium, dissolved, mg/L	Quarterly	Grab
Strontium, dissolved, mg/L	Quarterly	Grab
Silver, dissolved, mg/L	Quarterly	Grab
Thallium, dissolved, mg/L	Quarterly	Grab
Zinc, dissolved, mg/L	Quarterly	Grab

(1) Detection limits must follow the required reporting values (RRVs) in WQB-7. Dissolved metals analysis shall be by the EPA series 200 method described in "Metals (Atomic Absorption Methods)", Section 4.1.4 from Methods for Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983.
(2) See the definitions in Part I.A of the permit for explanation of terms.
(3) If no discharge occurs during the reporting period, "no discharge" shall be recorded on the DMR report form.
(4) Calculated by finding the sum of nitrate+nitrite and ammonia (as N) concentrations.
(5) If a visual examination of the discharge indicates the presence of hydrocarbons, by sheen, odor, or other sign, the permittee will be required to sample for Oil and Grease for that month.
(6) If a discharge occurs at any time during the reporting period monitoring must be conducted.

2. In-stream Monitoring

CRK-A (Silver Bow Creek)

In-stream monitoring in Silver Bow Creek is required upon issuance of the permit, or for at least 1 year before outfall 001 is used if the permittee does not expect to use this outfall for more than 1 year after issuance of the permit. This information will be used to assess the water quality improvement of Silver Bow Creek for use in future permit modifications and renewal. This pre-discharge monitoring is required due to the ongoing remediation efforts on Silver Bow Creek and the rapid improvement in the water quality. The infrastructure for outfall 001 is not in place, and the discharge may not be used for several years after the permit is issued. Pre-discharge monitoring will allow evaluation of current stream conditions if the outfall 001 is not to be used for at least several years (as is anticipated by the permittee).

As a minimum the following constituents shall be monitored at the frequency and with the type of measurement indicated in Table 13; samples or measurements shall be representative of the nature of the water body.

Table 13: In-stream Monitoring for Silver Bow Creek – CRK-A

Parameter[1]	Frequency	Type[2]
Temperature, °F	Monthly	Instantaneous
DO, mg/L	Quarterly	Grab
Total Suspended Solids (TSS), mg/L	Quarterly	Grab
Total Dissolved Solids (TDS), mg/L	Quarterly	Grab
Sulfate, mg/L	Quarterly	Grab
Ammonia (as N), mg/L	Quarterly	Grab
Nitrate + Nitrite (as N), mg/L	Quarterly	Grab
Total inorganic nitrogen (as N)[3], mg/L	Quarterly	Calculated
Orthophosphorus, mg/L	Quarterly	Grab
Total residual chlorine, mg/L	Quarterly	Grab
Whole Effluent Toxicity (WET), TU_a	Quarterly	Grab
Aluminum, dissolved, mg/L	Semi-annual	Grab
Antimony, total recoverable, mg/L	Semi-annual	Grab
Arsenic, total recoverable, mg/L	Semi-annual	Grab
Barium, total recoverable, mg/L	Semi-annual	Grab
Beryllium, total recoverable, mg/L	Semi-annual	Grab
Cadmium, total recoverable, mg/L	Semi-annual	Grab
Chromium, total recoverable, mg/L	Semi-annual	Grab
Copper, total recoverable, mg/L	Semi-annual	Grab
Fluoride, total recoverable, mg/L	Semi-annual	Grab
Iron, total recoverable, mg/L	Semi-annual	Grab
Lead, total recoverable, mg/L	Semi-annual	Grab
Manganese, total recoverable, mg/L	Semi-annual	Grab
Mercury, total recoverable, mg/L	Semi-annual	Grab
Nickel, total recoverable, mg/L	Semi-annual	Grab
Selenium, total recoverable, mg/L	Semi-annual	Grab
Strontium, total recoverable, mg/L	Semi-annual	Grab
Silver, total recoverable, mg/L	Semi-annual	Grab
Thallium, total recoverable, mg/L	Semi-annual	Grab
Zinc, total recoverable, mg/L	Semi-annual	Grab

(1) Detection limits must follow the required reporting values (RRVs) in WQB-7. Total recoverable metals analysis shall be by the EPA series 200 method described in "Metals (Atomic Absorption Methods)", Section 4.1.4 from Methods for Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983.

(2) See the definitions in Part I.A of the permit for explanation of terms.

(3) Calculated by finding the sum of nitrate+nitrite and ammonia (as N) concentrations.

The location of CRK-A shall be in Silver Bow Creek upstream of the outfall 001 location outside the influence of the discharge water, but within 500 feet of the discharge location. The applicant shall submit a map showing the location of CRK-A to the Department within 6 months after issuance of this permit. To provide consistency between sampling events, sample collection should occur at the same location and approximately same time of day.

CRK-B (Sheep Gulch)
In-stream monitoring in Sheep Gulch is required upon initiation of the discharge from outfall 002. This information will be used to assess compliance with B-1 water quality standards before the effluent mixes with the discharge water from the ASiMI facility. The ASiMI discharge water enters Sheep Gulch via the West Fork Sheep Gulch.

As a minimum the following constituents shall be monitored at the frequency and with the type of measurement indicated in Table 14; samples or measurements shall be representative of the nature of the water body.

Table 14: In-stream Monitoring for Sheep Gulch – CRK-B

Parameter[1]	**Frequency[2]**	**Type[3]**
Flow rate, mgd[4]	Daily	Instantaneous
Temperature, °F	Monthly	Instantaneous
DO, mg/L	Monthly	Grab
Total Suspended Solids (TSS), mg/L	Monthly	Grab
Total Dissolved Solids (TDS), mg/L	Monthly	Grab
Sulfate, mg/L	Monthly	Grab
Ammonia (as N), mg/L	Monthly	Grab
Nitrate + Nitrite (as N), mg/L	Monthly	Grab
Total inorganic nitrogen (as N)[5], mg/L	Monthly	Calculated
Orthophosphorus, mg/L	Monthly	Grab
Aluminum, dissolved, mg/L	Monthly	Grab
Antimony, total recoverable, mg/L	Monthly	Grab
Arsenic, total recoverable, mg/L	Monthly	Grab
Barium, total recoverable, mg/L	Monthly	Grab
Beryllium, total recoverable, mg/L	Monthly	Grab
Cadmium, total recoverable, mg/L	Monthly	Grab
Chromium, total recoverable, mg/L	Monthly	Grab
Copper, total recoverable, mg/L	Monthly	Grab
Fluoride, total recoverable, mg/L	Monthly	Grab
Iron, total recoverable, mg/L	Monthly	Grab
Lead, total recoverable, mg/L	Monthly	Grab
Manganese, total recoverable, mg/L	Monthly	Grab
Mercury, total recoverable, mg/L	Monthly	Grab
Nickel, total recoverable, mg/L	Monthly	Grab
Selenium, total recoverable, mg/L	Monthly	Grab
Strontium, total recoverable, mg/L	Monthly	Grab
Silver, total recoverable, mg/L	Monthly	Grab
Thallium, total recoverable, mg/L	Monthly	Grab
Zinc, total recoverable, mg/L	Monthly	Grab

(1) Detection limits must follow the required reporting values (RRVs) in WQB-7. Total recoverable metals analysis shall be by the EPA series 200 method described in "Metals (Atomic Absorption Methods)", Section 4.1.4 from Methods for Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983.

(2) Sample collection shall be conducted on the same date when effluent samples are collected at outfall 002.
(3) See the definitions in Part I.A of the permit for explanation of terms.
(4) Measurements shall be collected daily and reported as a weekly average. The method used to measure flow shall be accurate within 10% of the actual flow.
(5) Calculated by finding the sum of nitrate+nitrite and ammonia (as N) concentrations.

The location of CRK-B shall be in Sheep Gulch upstream of the confluence of Sheep Gulch and West Fork Sheep Gulch and outside the influence of the ASiMI discharge water in West Fork Sheep Gulch. The applicant shall submit a map showing the location of CRK-B to the Department within 6 months after issuance of this permit. To provide consistency between sampling events, sample collection should occur at the same location and approximately same time of day. In addition, to provide a useful comparison between effluent quality at outfall 002 and the quality of the effluent after it has traveled for approximately one mile in Sheep Gulch, the sample collection at CRK-B should occur on the same date that monitoring is conducted at outfall 002 (see Table 11).

3. Ground Water Monitoring

CESMW-1, CESMW-2 and CESMW-3

As a minimum, the following constituents shall be monitored at the frequency and with the type of measurement indicated in Table 15; samples or measurements shall be representative of the nature of the ground water.

Table 15: Ground Water Monitoring Below Sheep Gulch (outfall 002) – CESMW-1, CESMW-2 and CESMW-3

Parameter[1]	Frequency	Type[2]
Ground water elevation, ft above mean sea level	Monthly	Instantaneous
Total Dissolved Solids (TDS), mg/L	Monthly	Grab
Specific Conductance, umhos/cm	Monthly	Grab
Sulfate, mg/L	Monthly	Grab
Ammonia (as N), mg/L	Monthly	Grab
Nitrate + Nitrite (as N), mg/L	Monthly	Grab
Total inorganic nitrogen (as N)[3], mg/L	Monthly	Calculated
Aluminum, dissolved, mg/L	Monthly	Grab
Antimony, dissolved, mg/L	Monthly	Grab
Arsenic, dissolved, mg/L	Monthly	Grab
Barium, dissolved, mg/L	Monthly	Grab
Beryllium, dissolved, mg/L	Monthly	Grab
Cadmium, dissolved, mg/L	Monthly	Grab
Chromium, dissolved, mg/L	Monthly	Grab
Copper, dissolved, mg/L	Monthly	Grab
Fluoride, dissolved, mg/L	Monthly	Grab
Iron, dissolved, mg/L	Monthly	Grab
Lead, dissolved, mg/L	Monthly	Grab

Table 15: Ground Water Monitoring Below Sheep Gulch (outfall 002) – CESMW-1, CESMW-2 and CESMW-3

Parameter[1]	Frequency	Type[2]
Manganese, dissolved, mg/L	Monthly	Grab
Mercury, dissolved, mg/L	Monthly	Grab
Nickel, dissolved, mg/L	Monthly	Grab
Selenium, dissolved, mg/L	Monthly	Grab
Silver, dissolved, mg/L	Monthly	Grab
Strontium, mg/L	Monthly	Grab
Thallium, dissolved, mg/L	Monthly	Grab
Zinc, dissolved, mg/L	Monthly	Grab

(1) Detection limits must follow the required reporting values (RRVs) in WQB-7. Dissolved metals analysis shall be by the EPA series 200 method described in "Metals (Atomic Absorption Methods)", Section 4.1.4 from Methods for Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983.
(2) See the definitions in Part I.A of the permit for explanation of terms.
(3) Calculated by finding the sum of nitrate+nitrite and ammonia (as N) concentrations.

The upgradient (background) ground water monitoring well (CESMW-1) shall be located upgradient of outfall 002 and will be used as the ambient ground water conditions. CESMW-1 shall be located near Sheep Gulch approximately 500 feet upgradient of outfall 002 and should be outside the zone of influence of the effluent impacted ground water.

Downgradient well CESMW-2 shall be located near Sheep Gulch approximately 500 feet upgradient of the West Fork Sheep Gulch confluence. CESMW-2 will be used to determine ground water impacts due to the discharge at outfall 002 prior to mixing with the ground water beneath West Fork Sheep Gulch that has been impacted by the ASiMI discharge.

Downgradient well CESMW-3 shall be located near Sheep Gulch at the farthest available downstream location before Sheep Gulch is diverted around the Rhodia Inc.tailing ponds. This location will mark the end of the mixing zone, approximately 6,000 feet downgradient from the outfall location. This well will be used to determine compliance with water quality standards and nondegradation criteria (see criteria in Table 6). The results from CESMW-2 and the ASiMI monitoring well immediately above the Sheep Gulch confluence (GW-3) will be used to differentiate the source of the measured impacts at CESMW-3. Currently the MPDES permit monitoring requirements for GW-3 include fewer parameters and a lower monitoring frequency than for CESMW-2 and CESMW-3. When the ASiMI permit is renewed (scheduled for 2002), the monitoring requirements will be modified to be consistent with the CES permit, which will allow determination of which discharge may be causing impacts in the ground water at the end of the outfall 002 mixing zone.

CESMW-1, CESMW-2 and CESMW-3 shall be placed adjacent to Sheep Gulch above the normal high water mark. The applicant shall submit a map showing the proposed location of the monitoring wells to the Department within 6 months after issuance of this permit.

Ground water monitoring is required for at least 12 months prior to initiation of discharge from outfall 002. That water quality information will be used to determine the pre-discharge water quality and to determine any existing differences in water quality between CESMW-1 and CESMW-2/CESMW-3. Ground water monitoring will continue at the specified

schedule regardless of whether effluent has been discharged via outfall 002 since the previous sampling event.

Both wells shall be constructed in accordance with ARM 17.50.707. Both wells shall be screened approximately from the top of the high water table to 15 feet below the low water table. Completed well logs shall be submitted to the Department within 2 months after each well is completed.

Within 6 months of the issuance of this permit the applicant shall submit a copy of the standard operating procedures proposed for monitoring the wells. These procedures should address at a minimum, well purging equipment and procedures, sample collection equipment and procedures, equipment decontamination procedures, and sample storage and transportation procedures.

CESMW-4 and CESMW-5

As a minimum, the following constituents shall be monitored at the frequency and with the type of measurement indicated in Table 16; samples or measurements shall be representative of the volume and nature of the ground water.

Table 16: Ground Water Monitoring Below the Land Application Area (outfall 003) –CESMW-4 and CESMW-5

Parameter[1]	Frequency	Type[2]
Ground water elevation, ft above mean sea level	Monthly	Instantaneous
Total Dissolved Solids (TDS), mg/L	Semi-annual	Grab
Specific Conductance, umhos/cm	Semi-annual	Grab
Sulfate, mg/L	Semi-annual	Grab
Ammonia (as N), mg/L	Semi-annual	Grab
Nitrate + Nitrite (as N), mg/L	Semi-annual	Grab
Total inorganic nitrogen (as N)[3], mg/L	Semi-annual	Calculated
Aluminum, dissolved, mg/L	Semi-annual	Grab
Antimony, dissolved, mg/L	Semi-annual	Grab
Arsenic, dissolved, mg/L	Semi-annual	Grab
Barium, dissolved, mg/L	Semi-annual	Grab
Beryllium, dissolved, mg/L	Semi-annual	Grab
Cadmium, dissolved, mg/L	Semi-annual	Grab
Chromium, dissolved, mg/L	Semi-annual	Grab
Copper, dissolved, mg/L	Semi-annual	Grab
Fluoride, dissolved, mg/L	Semi-annual	Grab
Iron, dissolved, mg/L	Semi-annual	Grab
Lead, dissolved, mg/L	Semi-annual	Grab
Manganese, dissolved, mg/L	Semi-annual	Grab
Mercury, dissolved, mg/L	Semi-annual	Grab
Nickel, dissolved, mg/L	Semi-annual	Grab
Selenium, dissolved, mg/L	Semi-annual	Grab
Silver, dissolved, mg/L	Semi-annual	Grab
Strontium, dissolved, mg/L	Semi-annual	Grab

Table 16: Ground Water Monitoring Below the Land Application Area (outfall 003) –CESMW-4 and CESMW-5

Parameter[1]	Frequency	Type[2]
Thallium, dissolved, mg/L	Semi-annual	Grab
Zinc, dissolved, mg/L	Semi-annual	Grab

(1) Detection limits must follow the required reporting values (RRVs) in WQB-7. Dissolved metals analysis shall be by the EPA series 200 method described in "Metals (Atomic Absorption Methods)", Section 4.1.4 from Methods for Analysis of Water and Wastes, EPA-600/4-79-020, revised March 1983.
(2) See the definitions in Part I.A of the permit for explanation of terms.
(3) Calculated by finding the sum of nitrate+nitrite and ammonia (as N) concentrations.

The upgradient (background) ground water monitoring well (CESMW-4) shall be located upgradient of outfall 003, and will be used to determine the ambient ground water conditions. CESMW-4 shall be located approximately 500 feet upgradient of the most upgradient land application area.

The downgradient well (CESMW-5) shall be located approximately 100 feet downgradient of the land application areas.

The applicant shall submit a map showing the proposed location of the monitoring wells to the Department within 6 months after issuance of this permit.

Ground water monitoring is required for at least 6 months (minimum of two sampling events) prior to initiation of discharge from outfall 003. That information will be used to determine the pre-discharge water quality and to determine any existing differences in water quality between CESMW-4 and CESMW-5. Ground water monitoring will continue at the specified schedule regardless of whether effluent has been discharged via outfall 003 since the previous sampling event.

The wells shall be constructed in accordance with ARM 17.50.707. Both wells shall be screened approximately from the top of the high water table to 15 feet below the low water table. Completed well logs shall be submitted to the Department within 2 months after each well is completed.

Within 6 months of the issuance of this permit the applicant shall submit a copy of the standard operating procedures proposed for monitoring the wells. These procedures should address at a minimum, well purging equipment and procedures, sample collection equipment and procedures, equipment decontamination procedures, and sample storage and transportation procedures.

4. Soil Monitoring

SOIL-A and SOIL-B

As a minimum, the following constituents (in Tables 17 and 18) shall be monitored at the frequency and with the type of measurement indicated; samples or measurements shall be representative of the nature of the medium sampled.

Table 17: Soil Moisture Monitoring in Land Application Area (outfall 003) – SOIL-A

Parameter	Frequency	Type[1]
Soil Moisture Probe[2]	Daily	Instantaneous

(1) See the definitions in Part I.A of the permit for explanation of terms.

Soil moisture monitoring is required for at least one month prior to initiation of discharge from outfall 003.

Two soil moisture probes located on opposite sides of each of the three irrigation areas will be required. The probes should be below the root depth (approximately 5 feet below ground surface). The probes will be used to detect moisture that has infiltrated past the root zone. If free water is detected in a moisture probe beneath an area that is actively being irrigated, irrigation in that area should be suspended within 24 hours and the discharge directed towards one of the other irrigation areas.

Table 18: Soil Monitoring in Land Application Area (outfall 003) – SOIL-B

Parameter	Frequency	Type[1]
Plant available nitrate (as N)	Semi-Annual (April & October)	Composite[3]
Plant available ammonia (as N)	Semi-Annual (April & October)	Composite[3]
Plant available phosphorus	Semi-Annual (April & October)	Composite[3]
Plant available potassium	Semi-Annual (April & October)	Composite[3]
Plant available sulfur	Semi-Annual (April & October)	Composite[3]
pH, std. Units	Monthly[2]	Composite[3]
Cation Exchange Capacity (CEC), meq/100g	Monthly[2]	Composite[3]
Electrical conductivity of the saturation extract	Monthly[2]	Composite[3]
Total irrigated area, ft^2	Monthly[2]	Visual

(1) See the definitions in Part I.A of the permit for explanation of terms.
(2) Monitoring requirements will apply to each land application area that is used during the monthly reporting period during the months of May, June, July, August and September. Two soil borings (10 soil analyses) shall be collected from each land application used during the reporting period. Soil boring locations shall be rotated to avoid collecting samples from the same location over time.
(3) Each soil analyses will consist of 5 separate composite soil samples and analyses collected from a single boring at one-foot intervals in the upper 5 feet of the soil column.

Soil monitoring in Table 18 is required upon initiation of discharge via outfall 003.

Soil pH monitoring is required to insure that the pH remains above 6.5, which is the EPA (1981, 1992) recommended soil pH necessary to maintain the soils adsorptive and absorbtive capacity for metals.

The permittee must submit the following information to the Department, and the Department must determine it as adequate prior to discharging effluent to Outfall 003: 1) a level II soil survey that is adequate to define the soil and hydraulic properties of the irrigation area(s). That survey must be acceptable to the Department (the survey outlined in a letter from Cascade Earth Sciences dated October 5, 2001, would meet these

requirements); 2) information demonstrating that the irrigation system will be meet the EPA hydraulic and nutrient loading requirements for land application areas (EPA, 1981); and 3) demonstrate the irrigation facilities will be in compliance with applicable sections of Appendix B of the Circular DEQ-2 (Standards for the Spray Irrigation of Wastewater).

I. Information Sources

While developing the effluent limitations, monitoring requirements and special conditions for the draft permit, the following information sources were used to establish the basis of the draft permit and are hereby referenced:

(1) 40 CFR Part 122 - EPA Administered Permit Programs: The National Pollutant Discharge Elimination System.

(2) 40 CFR Part 423 – Steam Electric Power Generating Point Source Category.

(3) ARM Title 17, Chapter 30, Sub-chapter 5 - Mixing Zones in Surface and Ground Water.

(4) ARM Title 17, Chapter 30, Sub-chapter 6 - Surface Water Quality Standards.

(5) ARM Title 17, Chapter 30, Sub-chapter 7 - Nondegradation of Water Quality.

(6) ARM Title 17, Chapter 30, Sub-chapter 13 - Montana Pollutant Discharge Elimination System (MPDES) Standards.

(7) Barr Engineering Company, "Soil and Water Investigation Report: Rhodia Inc. Phosphate Plant, Silver Bow, Montana, July 1998.

(8) Barr Engineering Company, "Voluntary Cleanup Plan: Rhodia Inc., Silver Bow Plant, September 1999.

(9) Borduin, Micheal Wirkler, "Geology and Hydrogeology of the Sand Creek Drainage Basin, Southwest of Butte, Montana", June 1999.

(10) Cascade Earth Sciences, "Feasibility Analysis and Conceptual Design for Land Application of Process Water from a Gas-Fired Power Generating Facility", July 2001.

(11) Cascade Earth Sciences, "Third Order Soil Survey of Facility Site and Potential Areas for Process Water Land Application", September 10, 2001.

(12) Clean Water Act (CWA), 33 U.S.C. 1251 et seq.

(13) Circular WQB-7 (September 1999), Montana Numeric Water Quality Standards

(14) Continental Energy Services MPDES Permit Application Form 1 and Form 2D (and supplemental information), received June 11, 2001.

(15) Department of Environmental Quality MPDES permit and permit files related to Advanced Silicon Materials, Inc., USA; MPDES Permit # MT-0030350.

(16) Land & Water Consulting, Inc. “Water Quality Status and Trends Monitoring System for the Clark Fork-Pend Oreille Watershed – Summary Monitoring Report 1998”, July 1999.

(17) Montana Water Quality Act, MCA 75-5-101 et seq.

(18) "Montana List of Waterbodies in Need of Total Maximum Daily Load Development", the 303(d) list, dated 1996 and 2000.

(19) USEPA, “Process Design Manual: Land Treatment of Municipal Wastewater”, EPA 625/1-81-013, October 1981.

(20) USEPA, “Development Document for Effluent Limitations Guidelines and Standards, and Pretreatment for the Steam Electric Point Source Category”, EPA-440/1-82/029, November 1982

(21) USEPA, “Manual: Guidelines for Water Reuse”, EPA/625/R-92/004, September 1992.

(22) USEPA, “Technical Support Document for Water Quality-Based Toxics Control”, EPA/505/2-90-001), March 1991.

PREPARED BY: Montana Department of Environmental Quality, December 2001